

Scientific Application

The Extended Core Barrel (XCB) coring system is used in sedimentological, climate, and paleoceanographic studies.

XCB Operations

The XCB is used to recover 9.5 m long core samples from soft to moderately hard formations. The XCB is typically deployed when the formation becomes too stiff to piston core (i.e., upon piston coring "refusal") or when it is not hard enough to permit efficient recovery with the Rotary Core Barrel (RCB). The XCB cutting shoe extends ahead of the main bit in soft sediments but retracts into the main bit as the weight on bit increases when firm lithologies are encountered. The XCB uses the same bottom-hole assembly (BHA) as the Advanced Piston Corer (APC). The XCB relies on rotation of the drill string to advance the hole, and an integral cutting shoe trims the core sample at the same time.

Design Features

1) Cutting Shoe Trims Core

The XCB uses an integral cutting shoe to trim the core. The shoe is positioned ahead of the main core bit, which reduces core "washing"



Schematic of the XCB retractable cutting shoe in standard coring mode. The XCB shoe extends 6 to 14 in. ahead of the bit in very soft formations and retracts ~7 in. (inside the main bit) as weight on bit exceeds about 12,000 lb (collapses a coil spring).

(i.e., core damage caused by water jets from the main drill bit nozzles).

Benefit: Improves core recovery and reduces core disturbance in soft to moderately hard formations.

2) Retractable Cutting Shoe

A unique retraction device allows the XCB, which is normally extended ahead of the core bit, to retract inside the BHA until the cutting shoe is flush with the core bit.

Benefit: Cutting shoe is retracted to reduce failures when hard formations are encountered.

3) Nonrotating Core Liner

An inner core barrel swivel allows the core to remain stationary relative to the formation as the bit rotates, thereby reducing the transfer of rotary torque to weakly laminated formations.

Benefit: Reduces "biscuiting" (artificial layering), which is a type of core disturbance caused by transferring rotary torque to the core.

4) Compatibility

Utilizes the same BHA as the APC coring system.

Benefit: The APC and XCB core assemblies can be run in the same assembly, avoiding noncoring time for pipe trips.

Cutting Shoe Options

Soft Formations

Steel "sawtooth" serrated cutting profile hard-faced with tungsten carbide grit.

Hard Formations

Polycrystalline diamond compact (PDC), diamond impregnated, surface-set diamond, and thermally stable artificial diamond.



An 117/16 in. APC/XCB bit and soft formation XCB cutting shoe.

XCB Specifications

Core Diameter 2.312 in. (60 mm) Maximum Core Length 9.5 m Cutting Shoe Extension 7 in. beyond bit (maxium)

Typical Operating Range

Formation

Soft to medium firm sediments

Depth Range

Typically from APC refusal to ~400 to 700 m below seafloor (mbsf) in sediments and can core top of igneous basement (destroys shoe). Rate of Penetration Typically 30 to 12 m/hr.

Quantity of Core on Deck 1 to 2 cores/hr depending on water depth and formation

Limitations

Does not recover ooze or very soft sediments, granular formations (such as sand), fractured rock or rubble, or hard igneous formations.